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Examiner: William M. Brewster

Application No.: 10/617,413
Filing Date: 07/11/2003
Art Unit: 2823
Inventors: Steven Shuyong Xiao, Chunong Qiu and Cindy Xing Qiu

Title: **Organic Semiconductor Devices and Methods of Fabrication**

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Date: 10/20/2004
Subject: Response to Office Action Summary dated 09/15/2004

Dear Mr. Brewster:

The Office Action Summary dated 09/15/2004 on the above referenced patent application (10/617,413) has been received and reviewed. The efforts of the examiner in reviewing this application are kindly acknowledged.

[1] Claim Rejections - 35 U.S.C 102

Please allow Claims 9-12, 14 which are rejected by the examiner under 35 U.S.C 102 (e) as being anticipated by Forrest et al (US Publication No. **2003/0117068 A1**), based on the following justifications:

1. Different Parts of an Organic Optoelectronic Devices: ***Protective Layer*** vs. ***Active Region***

Forrest's patent application disclosed

1) a structure for a protected optoelectronic device (disclosed in Claims 1-20)
2) a structure for a protected OLED device (Claims 21-27)
3) a method for protecting an organic optoelectronic device (Claims 28-38).

In Forrest's patent application, he discloses **a double-protective-layer structure** to protect an organic optoelectronic device (include OLED, in Figures 2 and 3) from moisture and oxygen. Forrest also teaches **methods to prepare** the **double protective layer**. Although Forrest's structures (in Figures 2 and 3) include the double protective layers (170 and 180) as well as the **active region** (150) of a ***protected*** **OLED structure** (100), Forrest **does not** teach any structure or method for the fabrication of the **active region** (150) which is the **essential part** of an ***unprotected*** **OLED device**. Therefore, the objective of Forrest's patent application is to provide **a double protective layer structure** for the protection of OLEDs or other organic optoelectronic devices and **not** to provide a method or a structure for an active region in an OLED or other organic devices.

The present patent application provides novel methods for the fabrication of an organic materials-based semiconductor device (including an OLED) by first fabricating

separately the **two parts of the device** containing different functional layers, and then **combining** the two to form the final device by chemical means. Here, the final organic device, in the case of an OLED, is equivalent to the **active region** (150) in Forrest's structure (100) along with a bottom and a top substrate. Since the present application does not include a protective layer, our patent application teaches an **innovative method** to fabricate an ***unprotected*** **organic device** which is equivalent to an **active region (150)** in Forrest's structure (100).

2. ***Solidification*** (or ***Cross-linking***) ***within*** a ***Protective Sub-layer*** vs. ***Cross-linking between Two Polymeric Layers*** in the ***Active Region***

In Forrest's structure, the **protective layer** consists of a **first protective layer** (170) and a **second protective layer** (180). The second protective layer is a **composite barrier layer** formed by **a plurality of cooperative barrier sub-layers.** The sub-layers include the **first sub-layer** of polymeric material (181) and the **second sub-layer** of high density material (182). The **first sub-layer** (181) is formed by 1) applying a **liquid acrylic monomer** onto the first protective layer (170) and 2) **polymerizing** or **solidifying** the **monomer**. Before solidifying, the **liquid acrylic monomer layer** is **not** a polymer and it is soft. During the solidifying process, chains of molecules in the monomer layer, which are not linked to each other before the process, will be linked and as the results the monomer will be **hardened into a polymer**. This polymerization process is well known for products like UV ink or epoxy.

The above-mentioned **polymerization** process is **different** from the **cross-linking process** described in the present patent application. In our process, chemical **cross-**

linking takes place **between the two device parts at the interface of the two organic layers**. On the contrary, the **polymerization** of a monomer is the results of cross-linking molecules **within the monomer layer** and there is **no** reaction between any two materials.

In conclusion, Forrest et al disclose a **double protective layer structure** for a **protected** optoelectronic device and a method to protecting an organic optoelectronic device. They do ***not*** teach any structure or method for preparation of an **active region** in an organic optoelectronic device. Our application on the other hand, provides an innovative method for producing an organic optoelectronic device **including** the **active region** and **excluding** a **protective layer**. The bonding of the two separate parts in our invention is of a chemical cross-linking at the interface **between the two polymeric materials**. In Forrest's process, the polymerization takes place only **inside the protective sub-layer** (181) and the purpose of the polymerization is to **harden** the material and convert it into a polymer.

Due to above-presented facts, it is reasonable to argue that Claims 9-12, 14 of the present invention are not anticipated by Forrest et al. Please allow Claims 9-12, 14 of the present application based on the above-presented grounds.

Yours Truly,

Cindy X. Qiu